this branch of science his peculiar study, was appointed by the Board of Longitude to make astronomical observations in this country." The observatory was erected as soon as the colonists landed, but, being found small and inconvenient, a new one for the better reception of the instruments and the residence of Lieut. Dawes was built of stone, for which ample materials were found upon the spot.

The comet to which reference is here made was that of 1661, supposed to have been identical with the comet of 1532, and again expected about the end of 1788 or beginning of 1789. It is not difficult to explain how this body came to be associated with the arrival of the first Australian colonists. Halley, who had calculated the orbits of the comet observed by Apian in 1532, and that observed by Hevelius in 1661, gave very similar elements in his "Synopsis of Cometary Astronomy." Pingré considered the comets identical, and thought he had recognised several previous appearances, as detailed in his "Cometographie," which was published in 1783. Maskelyne appears to have adopted Pingré's opinion, and was at the trouble of preparing sweeping ephemerides, which he communicated to the Royal Society, and we may conclude that it was through his interest with the Board of Longitude that Lieut. Dawes was supplied with instruments and charged with a search for the comet. Mr. Russell says there is no record of what was done at the Dawes' Point Observatory, but since the comet was not observed as expected, we may infer there were only negative results to be reported, though Lieut. Dawes did occupy himself in other ways to assist in the progress of the colony.

CHEMICAL NOTES

THE water supply of Boston (U.S.A.) became contaminated about a year ago with some substance or substances which imparted to it a peculiarly nauseous odour and taste. Chemical examination resulted in showing a large percentage of "albuminoid ammonia," and also that the "free ammonia" increased somewhat rapidly when the water was kept. The production of ammonia, and also the odour and taste, was finally traced to the decomposition of a freshwater sponge (*Spongilla fluviatilis*, Anct.) present in large quantities on the sides and bottom of one of the storage basins; removal of this sponge was followed by improvement in the water (see *Analyst*, viii. p. 184).

PROF. CLEVE describes, in the August number of the *Journal of the Chemical Society*, methods for extracting and purifying the earth *samaria*. From determinations of the amount of sulphate obtained from quantities of this oxide, Cleve deduces the number 150 as the atomic weight of the metal *samarium*. Various salts of samarium are described; the metal is closely allied to didymium.

HARTLEY showed some time ago (*C.S.J. Trans.* for 1882, p. 84 *et seq.*) that the ultra-violet spectra of elements belonging to the *same series* (in the nomenclature of the periodic law) exhibit fairly marked analogies as regards general character; recent observations of the spectrum of beryllium and comparison of this spectrum with that of allied metals have led Hartley to the conclusion that this metal probably belongs to the group which contains magnesium, calcium, &c., and not to that containing aluminium, scandium, &c. But if this is so, oxide of beryllium must be represented as BeO, and the atomic weight of the metal—about which there has lately been so much dispute—must be taken as 9 (*C.S.J. Trans.* for 1883, p. 316).

V. MEYER has recently separated, from benzene oils, a compound to which he gives the name of *Thiophen*. The composition of this body is represented by the formula C_4H_4S; it presents the closest analogy in general reactions with benzene, yielding a sulphonic acid, a methyl derivative, &c.; it reacts with diketones to form highly coloured compounds. The further study of this interesting compound, now being carried on in Prof. Meyer's laboratory, is likely to lead to important results (*Berichte*, xvi. 2968).

OSTWALD has recently made a further advance in his study of chemical affinity. He has examined the action of acids on methylic acetate, determining the velocity-coefficients of various acids, and from these calculating the relative affinities of the acids in terms of hydrochloric acid taken as 100. His results are entirely in keeping with the theory of Guldberg and Waage, and confirm the supposition that each acid possesses a specific affinity constant. The determination of affinity constants for groups of compounds must evidently be a work of preeminent importance to chemical science. Ostwald's results, *e.g.* for acetic and trichloracetic acids, enable us to see that in these constants we shall find materials for constructing a theory which will represent the connection between molecular structure and reactions as resting on a real basis, and not, as is done at present, on a purely formal conception (*J. für pract. Chem.* (2) xxviii. 449).

A NUMBER of redeterminations of atomic weights have recently been published. The most important are these:—

Thorpe,	Ti =	48·0,	*Berichte*, xvi. 3014.
Baubigny,	Ni =	58·75,	*Compt. Rend.* xcvii. 951.
,,	Cu =	63·46,	,, ,, 906.
Brauner,	Te =	125·0,	abstract in *Berichte*, xvi. 3055 (original in Russian).
Marignac,	Bi =	208·16,	*Archiv. des Sci. Phys. et Nat.* (3) x. 5.
,,	Mn =	55·07,	,, ,, ,,
,,	Zn =	65·29,	,, ,, ,,
,,	Mg =	24·37,	,, ,, ,,
Löwe,	Bi =	207·33,	*Zeitschr. Anal. Chem.* xxii. 489.

IT is known that Dr. Landolt, after laborious researches into the refracting power of chemical compounds, arrived at the conclusion that it may be expressed, for organic bodies, by a very simple equation: the refracting power of the compound is equal to the sum of the same powers of carbon, hydrogen, and oxygen, multiplied each by the number of atoms of each of these bodies which enter into the compound. This law proved, however, not to be quite exact with regard to several organic bodies, and the researches of Herr Bruhl established that in the lower compounds the refracting power received from the equation must be increased by two units for each double pair of atoms of carbon. These results had been arrived at with liquid compounds. As to the solid ones, which were the subject of the researches of Dr. Gladstone, it was desirable to pursue these researches to the same degree of accuracy as the researches of Landolt and Bruhl. M. Kanonnikoff has prosecuted this work on a great many solid bodies belonging to both groups of the fatty series, the aromatic series and the group of terebenes and camphors. He publishes now in the *Memoirs* of the Kazan University and (abridged) in the *Journal of the Russian Chemical Society* (vol. xv. fasc. 7) the results of his researches. It appears from them that the method of determining the refracting power of a solid from its solution, applied by Dr. Gladstone, is quite satisfactory, the dissolved body not changing its refrangibility when dissolved, and that the laws discovered by Landolt and Bruhl for liquid bodies are quite true also with regard to solids. This inquiry at the same time enables M. Kanonnikoff to arrive at most interesting conclusions as to the structure of the investigated bodies.

THE atomic weight of tellurium not corresponding to what it ought to be according to Prof. Mendeléeff's theory of periodicity, M. Brauner has tried to determine it again with greater accuracy. The chief difficulty is to have the tellurium free from selenium, but this difficulty has been overcome, and the body has been obtained in beautiful crystals. As to Berzelius's method for the transformation of tellurium into anhydride, M. Brauner discovered that it is liable to considerable losses, and to avoid them he has had to take the most minute precautions. The process was controlled also by transforming tellurium into a new salt, $Te_2O_4SO_3$, and by the synthesis of the telluric copper, Cu_2Te. The results are four series of figures varying from 124·94 to 125·40, which would give, on the average, an atomic weight of 125, that is, corresponding to the theory.

WE find, in the last number of the *Journal of the Russian Chemical Society*, an interesting theory of solutions, by M. Alexeyeff; the forces of gravitation, cohesion, and chemical affinity being considered as three different degrees of one single force, which differ from one another only by the distances at which the action of the force is exercised. M. Alexeyeff asks, Which of these two last forces, of cohesion or of chemical affinity, is manifested in solutions? and pronounces himself for the former. The simplest cases of solutions are, in fact, those where there is no chemical affinity between the bodies dissolving and dissolved. Such cases were well known long since for gases and solid bodies. The solution of gases in solid bodies is quite analogous to imbibition of solids with liquids, and the much greater solubility of gases in liquids may be easily explained by the easier penetration of gases between the molecules of a liquid; the law of solubility of gases given by Dalton is perfectly agreeable with the supposition that the dissolved gases maintain

their own aggregation when dissolved. The same is true with regard to solutions of liquids. The simplest of these is the solution of phenol and aniline in water. The stability of the compound formed by phenol with aniline shows that both have no affinity to water. Further, M. Alexeyeff discusses the applicability of his theory to bodies which easily pass from one state to another, and the relations of water to colloids. The solutions of liquids in liquids being, on his hypothesis, quite like emulsions. He is engaged now in experiments intended to show that the common emulsions have the properties of solutions.

M. FLAVITSKY proposes, in the *Journal of the Russian Chemical Society*, the following interesting theory of chemical affinity. According to this theory, the atoms of each simple chemical body, when its molecule is dissociated, move in circles parallel to one another, and to a certain plane, the position of which is constant in space. Each chemical element has its own plane of motion, and the circles described by the atoms of different elements cross one another under different angles. Besides, the atoms of opposite elements (such as metals and haloids) move in opposite directions. The chemical relations between different elements would thus depend upon the masses of the atoms, their velocities, their positions on their orbits, the direction of the motion, and the angles between the orbits; while the chemical combinations would be nothing more than the mutual destruction (or rather equilibration) of the velocities of the atoms of the respective chemical elements which enter into a combination. This supposition would explain all the variety of chemical relations even without a great difference in the masses of the atoms and their velocities; a complete stop might be brought only when the orbits are parallel, or the orbits being inclined with regard to one another—when a certain number of velocities acting under different angles make together the necessary resultant. This mutual action of the atoms on one another could be imagined—the author says—at a distance, by means of the ethereal medium which would be thus the medium of transformation of the physical energy into the chemical one.

TECHNICAL EDUCATION[1]

GENERAL OBJECTS

THE object of the Central Institution is to give to London a College for the higher technical education, in which advanced instruction shall be provided in those kinds of knowledge which bear upon the different branches of industry, whether manufactures or arts.

Just as the Royal School of Mines gives a technical training to mining engineers, so the Central Institution is intended to afford practical scientific and artistic instruction which shall qualify persons to become—

1. Technical teachers.
2. Mechanical, civil, and electrical engineers, architects, builders, and decorative artists.
3. Principals, superintendents, and managers of chemical and other manufacturing works.

The main purpose of the instruction to be given in this Institution will be to point out the application of different branches of science to various manufacturing industries; and in this respect the teaching will differ from that given in the Universities and in other institutions in which science is taught rather for its own sake than with the view to its industrial application. In order that this instruction may be efficiently carried out, the Institution, in addition to the lecture theatres and class rooms, will be fitted with laboratories, drawing offices, and workshops; and opportunities will be afforded for the prosecution of original research, with the object of the more thorough training of the students, and for the elucidation of the theory of industrial processes.

STUDENTS

It is probable that the students seeking admission into the Central Institution will belong to one or other of the following classes:—

1. Persons who are training to become technical teachers.

These will be students entering the College by means of exhibitions under category 2 (*b*); or students selected at the May examinations in technology who pass with special distinction in the Honours Grade; or teachers of the Institute, registered under the scheme of technological examinations, who, during certain months of the year, when they are disengaged, will receive gratuitous instruction, and will have the opportunity of using the laboratories, collections of machinery, instruments, and apparatus with which the College will be provided.

2. Persons not under sixteen years of age who, having passed a matriculation or entrance examination, are prepared to take a complete course of instruction with a view to some professional or industrial occupation. These students will probably belong to two classes—

(*a*) Persons who pay full fees, and will receive in this Institution an education similar, in many respects, to that which they may acquire in one of the technical high schools of the Continent.

(*b*) Persons who are received into the Institution from the Finsbury Technical College, or other similar colleges in the provinces, by means of exhibitions, which will cover the whole or part of their educational and other expenses.

It is probable that many of the persons in sub class (*b*) will be select pupils from the public elementary and national schools, who, having received a preliminary science training, and distinguished themselves at the Finsbury Technical College or elsewhere, will proceed to the Central Institution in the hope of qualifying themselves for some of the higher posts in engineering or manufacturing industry.

3. Persons who, having been already engaged in industrial pursuits, desire to attend special courses, with the view of acquainting themselves more fully with the scientific principles underlying their work.

CONDITIONS OF ENTRANCE

The matriculation or entrance examination for students intending to take the ordinary science curriculum, with the view of subsequently obtaining a diploma, will include mathematics, pure and applied; chemistry; physics; drawing, and modern languages. Whilst considerable freedom will be allowed to students entering the College as regards the courses of instruction which they desire to follow, a definite scheme of instruction will be drawn up for each of the different branches of industry, and students intending to spend two or three years in the College and to devote their whole day to study will be recommended to follow the scheme laid down. The fee for the courses to be pursued by a matriculated student will be about 30*l*. per annum, and a fee of about 20*l*. per annum will be charged to students wishing to take special courses and to occupy themselves for the greater part of the day with laboratory practice and research work. With the view of encouraging research work, the Institution will be provided with separate laboratories in which the students will have the opportunity of working without distraction or disturbance. The permission to use these laboratories will be reserved for the advanced students who have previously passed through the ordinary courses of the College, and for non-matriculated students under very special circumstances.

SUBJECTS OF INSTRUCTION

As the object of this Institution is to train technical teachers, proprietors and managers of chemical manufactories and of other industrial works, as well as mechanical, civil and electrical engineers, architects, builders, and persons engaged in art industries, the Institution will comprise five chief divisions, viz.:—(1) Chemical Technology; (2) Engineering, mechanical, civil, and electrical; (3) General Manufactures; (4) Architecture and Building Construction; (5) Applied Art; and the subjects of instruction may accordingly be grouped under the general headings of Chemistry, Engineering, Mechanics and Mathematics, Physics, Manufacturing Technology and Art. Inasmuch as the Royal School of Mines is already established as a training school for mining engineers, no provision will be made for the instruction of students in this branch of industry; and consequently the sciences of geology, mineralogy, and metallurgy will not necessarily be included in the subjects of instruction at the Central Institution.

PROFESSORIAL STAFF

Chemistry.—The main object of the instruction in this department will be to afford to students facilities for acquiring a knowledge of the highest branches of Chemistry, and of its application to such industries as alkali manufacture, the manufacture of artificial colouring matters, brewing, soap boiling, the manufacture of oils and varnishes, dyeing, &c. To provide the requisite instruction in this department, it will be necessary to

[1] The scheme for the organisation of the Central Institution of the City and Guilds of London Institute, recommended to the Council for adoption at a meeting of the Executive Committee held January 21, 1884, is now being circulated. We regard the matter as so important, and the scheme so perfect in its way, that we give it in full.